REMARKS

Status of Claims

Claims 20-29 were pending in the application.

Claim 27 previously claimed "a connection". Applicants are uncertain whether "a connection" this is statutory class of patentable subject matter. Accordingly, claim 27 is amended to claim An airgap-insulated exhaust manifold (3) connected to an inlet port (12) of a housing (13) of a turbocharger. Claim 20 is amended in parallel.

The claims are now limited to the the preferred embodiment wherein the "exhaust assembly" is a turbocharger as disclosed in paragraph [0025] of the published specification.

Limitations from claims 28 and 29 have been incorporated into claims 20 and 27. Claims 28 and 29 are thus cancelled.

Accordingly, claims 20-27 are presented for examination.

Present Invention

The claims are directed to a novel method of joining an exhaust pipe to a cast metal inlet port (12) of a housing (13) of a turbocharger, and to the joined product formed thereby.

More specifically, the connection is formed between an airgap-insulated exhaust manifold (3) and an inlet port (12) of a housing (13) of a turbocharger. The airgap-insulated exhaust manifold (3) has an has an inner pipe (7), which is a gas-carrying pipe (7) of the exhaust manifold (3), and an outer pipe (9), the outer pipe (9) being manufactured from at least one sheet metal component. To form the joint,

- the outer shell (9) of the airgap-insulated exhaust manifold (3) is slid over the outside of the turbocharger opening (12) while introducing the inner pipe (7) into the port (12) of the housing (13) of the turbocharger, such that the turbocharger inlet port opening (12) is located between the inner gas-carrying pipe (7) and outer sheet-metal heat-insulating pipe (9) of the airgap-insulated exhaust manifold (3) (see Fig. 1), and then

- the at least one sheet metal outer pipe (9) and the inlet port (12) are joined by means of a pulse-welding method.

This "sandwich" structure if the welded junction increases the rigidity of the connection as compared to the prior art, all of which at best discloses two tubes being inserted inside of the opening.

Further, in accordance with the claims as amended, the exhaust aggregate is a turbocharger.

None of the prior art shows a turbocharger welded together with an exhaust manifold, which makes sense only in accordance with the present invention as currently defined because the outer pipe of the manifold is of sheet metal. If it were of cast iron as in the past, welding together would not be advantageous, because if the (cheap) manifold becomes defective, the (expensive) welded turbocharger cannot be separated therefrom!

In contrast, in accordance with the present claimed structure, if the sheet metal manifold becomes defective, it can easily be separated from the turbocharger housing and a new exhaust pipe welded to the turbocharger housing.

Thus, a sheet metal manifold gives the possibility to use a welding connection, which is of course advantageous compared to a flange connection, (considering, weight, price etc.).

Claim Rejections - 35 U.S.C. § 103

Claims 20-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art on pages 1-2 in the instant specification, AAPA, in view of Combs 4,138,986 and Mitsui et al 5,521,353.

Applicants respectfully traverse, in view of the claims as presently amended.

According to DE 19819946 (first AAPA), exhaust gas manifolds are cast because only casting can provide the tight radius of pipe curvature necessary in an engine compartment. Steel sheet metal pipes have the advantage of being light-weight, but cannot be bent to form the required tight bend. DE '946 is based on the discovery that the overall weight of the exhaust conduit can be reduced by (a) casting a short curved pipe section of tight radius and (b) connecting this, via a flange, to a second (comparatively) light weight steel pipe section. The

exhaust manifold is thus not an airgap-insulated exhaust manifold, and the connection type taught in this reference is a conventional flange-to-flange connection; there is no welding of a sheet metal pipe section to a cast exhaust outlet port.

DE 10022052 (second AAPA), teaches a turbocharger wherein the inlet funnel (10), rotor casing (20) and exhaust pipe (50) consist of embossed or deep-drawn sheet metal. The inlet funnel consists of two half shells or is in one piece, and may be formed by an internal high pressure moulding technique, and may be sized over an internal mandrel. A sheet metal exhaust pipe may be welded to the sheet metal inlet funnel, only because the inlet funnel and manifold are both made of sheet metal. The exhaust manifold is thus not an airgap-insulated exhaust manifold, and the connection type taught in this reference is a conventional flange-to-flange connection; there is no welding of a sheet metal pipe section to a cast exhaust inlet port.

There is no suggestion in either of the AAPA references that light-weight yet gas-tight connection between (a) an airgap-insulated exhaust pipe having an inner gas carrying pipe and an outer sheet metal exhaust pipe and (b) a cast turbocharger inlet port can be achieved by any means other than by joining flanges, including a seal. Given the danger of exhaust gas leakage into a passenger compartment of an automobile or bus, it must be understood that "obvious to try" a new joining technique is not the test. The invention is not made until an attempt has been made to join an airgap insulated exhaust pipe to a cast metal housing of a turbocharger by inserting the inner gas carrying pipe into the inlet of the turbocharger while sliding the outer heat-insulating sheet-metal pipe around the outside of the turbocharger inlet, and welding the sheet metal tube to the turbocharger casting, and then verifying that a gas tight seal can be formed by this new method, this new seal being able to survive repeated thermal cycling, with the sheet metal and cast pipe having differential coefficient of expansion, over an extended period of time. That which is missing from AAPA is not taught in the secondary references.

Turning back to the Office Action, according to the Examiner the instant claims define that a pulse welding is used to connect the dissimilar metals. Use of laser, TIG, MAG is claimed. The patent to Combs teaches connecting a cast manifold ring to a sheet metal connector pipe using welding. See column 8, lines 57-64, teaching that a cast article in a firebox is connected to sheet metal via welding.

Applicants respectfully traverse. Combs teaches that a cast iron ***firebox*** (15) (col. 7, lines 60-61) which may have a rolled steel ring (28) cast into the top of firebox (15) (col. 8, lines 57-60). The ***steel ring*** (28) may be welded to the cylindrical steel shell of heat exchanger (16)(col. 8, lines 59-60). Thus, Combs simply teaches that steel may be welded to steel, or, Combs at best teaches that to connect a sheet metal conduit to a cast iron body, the cast iron body must have a steel connecting element cast into place to which the sheet metal conduit can be welded. Combs does not teach welding an exhaust manifold directly to at least the port (12) of the exhaust assembly (5) manufactured from cast metal. Nowhere does Combs teach or suggest a method of claim 20 comprising introducing the inner pipe (7) into the port (12) of a cast turbocharger housing (13) and welding the outer sheet-metal heat-insulating part of the airgap insulated exhaust pipe to the inlet port of the turbocharger housing (12) by means of a pulse-welding method .

Thus, the AAPAs alone or read in combination with Combs have no suggestion to weld a sheet metal exhaust pipe to a cast iron port. Even if they could provide suggestion, "obvious to try" is not the test of obviousness – the results must be predictable. Here, the success of the new type of junction can not be predicted from the teaching of these references. In fact, the Combs teaching of the need for the step of casting a rolled steel ring into the cast firebox is a teaching that direct welding of the steel heat exchanger to the cast iron firebox would not be expected to produce a successful, durable, gas-tight junction.

Next, the Examiner concedes that the use of pulse welding is not taught in the above references. In this respect the Examiner cites the patent to Mitsui et al for teaching that welding of sheet metal with pulse welding is conventional. See paragraph 0026. Mitsui et al also mention in paragraph 31 that cast iron can also be welded.

In response, Applicants have carefully reviewed this reference and find therein no teaching that sheet metal can be welded to cast iron, and most importantly, that a sheet metal conduit can be welded to a cast iron turbocharger inlet port. The present specification goes into great length to explain the difficulty of forming such a welded connection, particularly with the high reliability and durability required of a conduit carrying exhaust gas under pressure, where leakage of exhaust gas could present a problem of poisoning of occupants of a motor vehicle.

Mitsui at best teaches: "The described method has been practiced with steel base thin sheets of material but it should be readily obvious that ***other materials may be welded*** using this technique ***such as cast iron*** or carbon steel which may require pre-heating and using the MAG welding technique or MIG welding aluminum or aluminum alloy sheets is also possible. The welding of metal having high thermal conductivity such as copper, brass, aluminum and magnesium is also possible as is the welding of stainless steel, ferrite-based alloys, alloys of the martensitic family or alloys of precipitation hardening. In addition, welding of titanium by TIG welding can also be performed." The person of ordinary skill would read this as simply teaching that metals may be joined to similar metals. There is no express teaching that metals may be welded to dissimilar metals, and the person of ordinary skill is well aware of the difficulties of forming such junctions, thus would find in this reference no such suggestion.

In conclusion, the cited references do not allow the person of ordinary skill to envision, or to expect success of, welding of a sheet metal pipe section to a cast exhaust outlet port. Considering the hazards attendant to failure of such a junction, the person of ordinary skill would not be lead by these references to make or foresee success of the present invention.

Accordingly, withdrawal of the rejections and early issuance of the Notice of Allowance is respectfully requested.

Response to Arguments

Applicants appreciate the Examiner's helpful comments that the claims do not conform with the arguments by not specifying which pipe (outer or inner) is welded to the port, or even whether the port was an exhaust port or an inlet port. The claims were also apparently confusing in that the Examiner understood the inner pipe to possibly comprise part of the port, and the claim reading on welding the outer pipe to the inner pipe.

Accordingly, Applicants have clarified the claims. The claims as amended do not simply claim a method of welding sheet metal to cast iron. Rather, the claims are directed to a novel method for economically joining an exhaust pipe to a turbocharger whereby the weight and cost of joining by bolting or v-banding together two cast metal flanges is avoided.

Rather, the claims are directed to a novel method of joining an exhaust pipe to a cast metal inlet port (12) of a housing (13) of a turbocharger, and to the joined product formed thereby.

More specifically, the connection is formed between an airgap-insulated exhaust manifold (3) and an inlet port (12) of a housing (13) of a turbocharger. The airgap-insulated exhaust manifold (3) has an has an inner pipe (7), which is a gas-carrying pipe (7) of the exhaust manifold (3), and an outer pipe (9), the outer pipe (9) being manufactured from at least one sheet metal component. To form the joint,

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- the at least one sheet metal outer pipe (9) and the inlet port (12) are joined by means of a pulse-welding method.

This "sandwich" structure if the welded junction increases the rigidity of the connection as compared to the prior art, all of which at best discloses two tubes being inserted inside of the opening.

None of the prior art shows a turbocharger welded together with an exhaust manifold, which makes sense only in accordance with the present invention as currently defined because the outer pipe of the manifold is of sheet metal. If it were of cast iron as in the past, welding together would not be advantageous, because if the (cheap) manifold becomes defective, the (expensive) welded turbocharger cannot be separated therefrom!

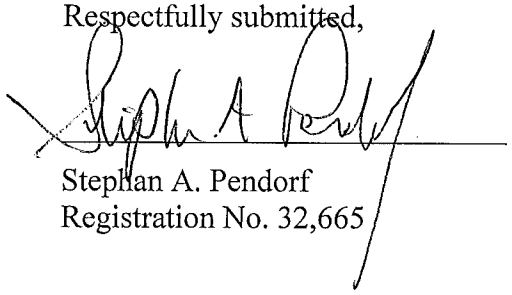
In contrast, in accordance with the present claimed structure, if the sheet metal manifold becomes defective, it can easily be separated from the turbocharger housing and a new exhaust pipe welded to the turbocharger housing.

Thus, a sheet metal manifold gives the possibility to use a welding connection, which is of course advantageous compared to a flange connection, (considering, weight, price etc.).

Should further issues remain prior to allowance, the Examiner is respectfully requested to contact the undersigned at the indicated telephone number.

The Commissioner is hereby authorized to charge any fees which may be required at any time during the prosecution of this application without specific authorization, or credit any overpayment, to Deposit Account Number 16-0877.

Respectfully submitted,



Patent Central LLC
1401 Hollywood Blvd.
Hollywood, FL 33020-5237
(954) 922-7315

Stephan A. Pendorf
Registration No. 32,665

Date: **June 2, 2011**